

WACKER

CREATING TOMORROW'S SOLUTIONS

VINNAPAS®

CARPETS | POLYMER DISPERSIONS | EUROPE, MIDDLE EAST, AFRICA

MAKE THE MOVE TO VINNAPAS® VAE TECHNOLOGY

High-Quality Binders for Carpet Applications



Producing poly(vinyl acetate) dispersions since 1938, WACKER pioneered the development of vinyl acetate-ethylene (VAE) copolymer dispersions in 1960. Today, WACKER is a global market leader and driving force behind innovation in VAE copolymer dispersions, which are essential components in many applications in the carpet, adhesive, architectural coating and nonwoven industries.

MAKE THE MOVE TO A RELIABLE SOLUTION

VINNAPAS® dispersions based on vinyl acetate-ethylene (VAE) fulfill all technical requirements needed in carpet backing applications. They are therefore suitable for tufted carpet broadloom and tile production, as well as for needlefelt and woven applications. In addition, VAE dispersions excel in low odor, low emissions and flammability resistance.



Benefits of VINNAPAS®



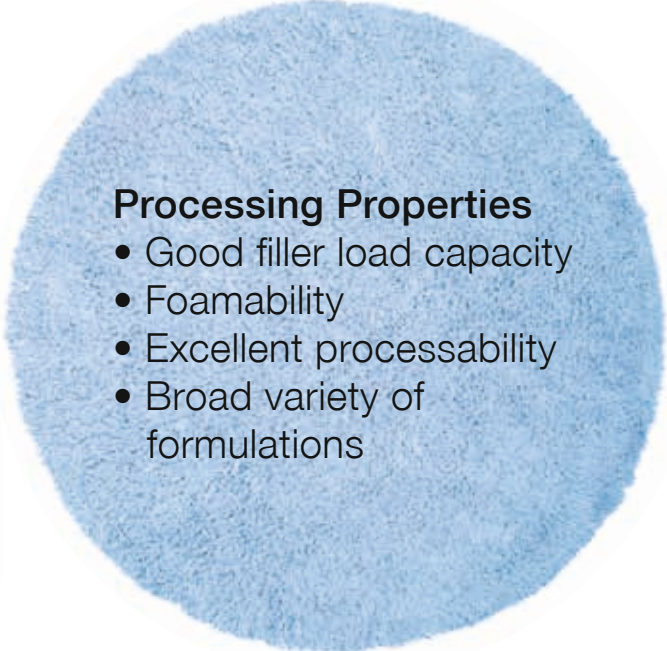
VAE Dispersion Properties

- Low odor
- Low emissions
- Low flammability, reduced smoke



Application Properties

- Good tuft bind
- Good delamination
- Cut edge stability
- Dimensional stability
- Soft to stiff handfeel



Processing Properties

- Good filler load capacity
- Foamability
- Excellent processability
- Broad variety of formulations

TUFTED CARPET LAYERS: BENEFIT FROM VAE IN PRECOAT AND SECONDARY COATING

Secondary Coating:

Formulated with VINNAPAS® VAE dispersions; filled with calcium carbonate and adjusted with additives, e.g. dispersing agents or thickeners. Main function: delamination properties; fixation of secondary backing; contributes to the dimensional stability of carpets.

Precoat:

Formulated with VINNAPAS® VAE dispersions; filled with calcium carbonate and adjusted with additives, e.g. dispersing agents or thickeners. Main function: tuft bind. The precoat fixes the fibers to the primary backing.

Primary Backing:

Can be made from woven or non-woven fabrics. Main function: carrier for fibers.

Carpet Face:

Made from synthetic fibers – such as polyamide, polypropylene and polyester – or natural fibers, such as wool or sisal.

Secondary Backing:

Commonly made of woven polypropylene. Also used are felts or heavy weight backings. Main function: contributes to the dimensional stability of carpets.

SUPERIOR CHEMISTRY FOR CARPET BACKINGS

Products based on VAE copolymers have always enjoyed their share of the carpet adhesive industry. The reason lies in the specific structure of VAE copolymers which allows for an optimization of strength and flexibility – characteristics that are especially valuable for carpet backings.

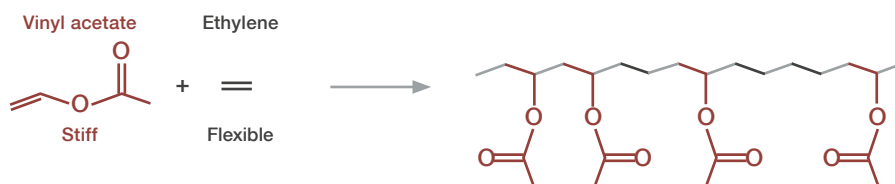
Unique Properties due to a Unique Technology

Similar to SB latex, VAE dispersions consist of two building blocks which deliver stiffness (vinyl acetate) and flexibility (ethylene). Specific application properties like handfeel can be adjusted by the composition of the two monomers.

The incorporation of ethylene into the VINNAPAS® carpet backing dispersion internally plasticizes the products and results in inherently high adhesive strength that maintains good flexibility and enables the use of VAE, e.g. as precoat layer and/or secondary coating in tufted carpet applications.

Today's generation of VINNAPAS® VAE polymer dispersions delivers tuft bind and delamination strength in carpet that compete well with styrene butadiene (SB) latexes.

Two Monomer Bases Create the Desired Balance Between Stiffness and Flexibility



Ethylene

- Polymer Tg approx. -100 °C (soft)
- Hydrophobicity
- Permanent flexibility
- Ideal copolymerization with VAM

Vinyl acetate

- Polymer Tg approx. 35 °C (hard)
- Polar, hydrophilic

Vinyl acetate-ethylene

(VAE copolymer dispersion)

- Handfeel depends on ethylene content
- Excellent adhesion to polypropylene fibers
- Good binder adhesion on polyamide fibers
- Excellent compounding properties
- Good filler acceptance
- Excellent film forming properties

SUPERIOR CHARACTERISTICS FOR YOUR PRODUCTS

Compared to SB latex, our VINNAPAS® VAE dispersions offer several additional advantages, such as flame retardancy and low odor.

Lower Flammability

VINNAPAS® polymers based on VAE have a lower flammability compared to SB latex. Samples of polymer films with calcium carbonate (carpet model formulation with 150% dry filler loading) are tested in a fume chamber according to DIN 4102-1. The results: films based on SB latex burn emitting black smoke, while VAE films only burn slightly producing white smoke or are self extinguishing.



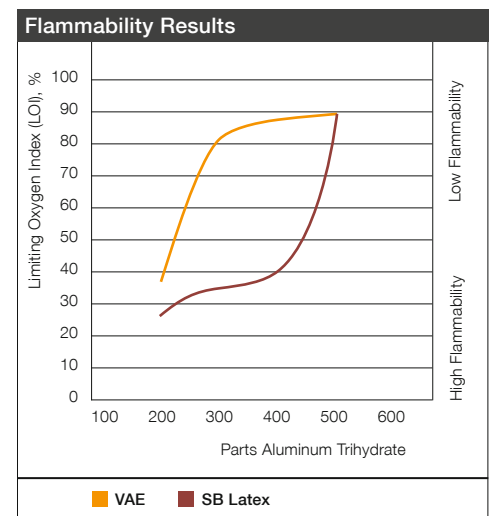
VAE/calcium carbonate film (150% filler loading) according to DIN 4102-1; self extinguishing.



SB latex/calcium carbonate film (150% filler loading) according to DIN 4102-1.

For commercial applications aluminum trihydrate (ATH) is used to achieve flame retardant properties in carpets. With VAE dispersions, ATH content can be reduced significantly as confirmed by Radiant Panel tests according to DIN ISO 92391 or the LOI test.

These results are confirmed by limiting oxygen index (LOI) test results of compounds with aluminum trihydrate (ATH) as filler: the LOI is a measure of the percentage of oxygen that has to be present to support combustion of the polymer – the higher the LOI the lower the flammability. In the LOI test, a candle-like sample is supported in a vertical glass column and a slow stream of oxygen/nitrogen mix is fed into the glass column. The sample is ignited with a flame and burns downward into unheated material. The oxygen/nitrogen ratio can be varied and the test records the minimum concentration of oxygen (as a percentage) that will just support combustion.



Low Emissions of Carpets with VAE Backcoatings

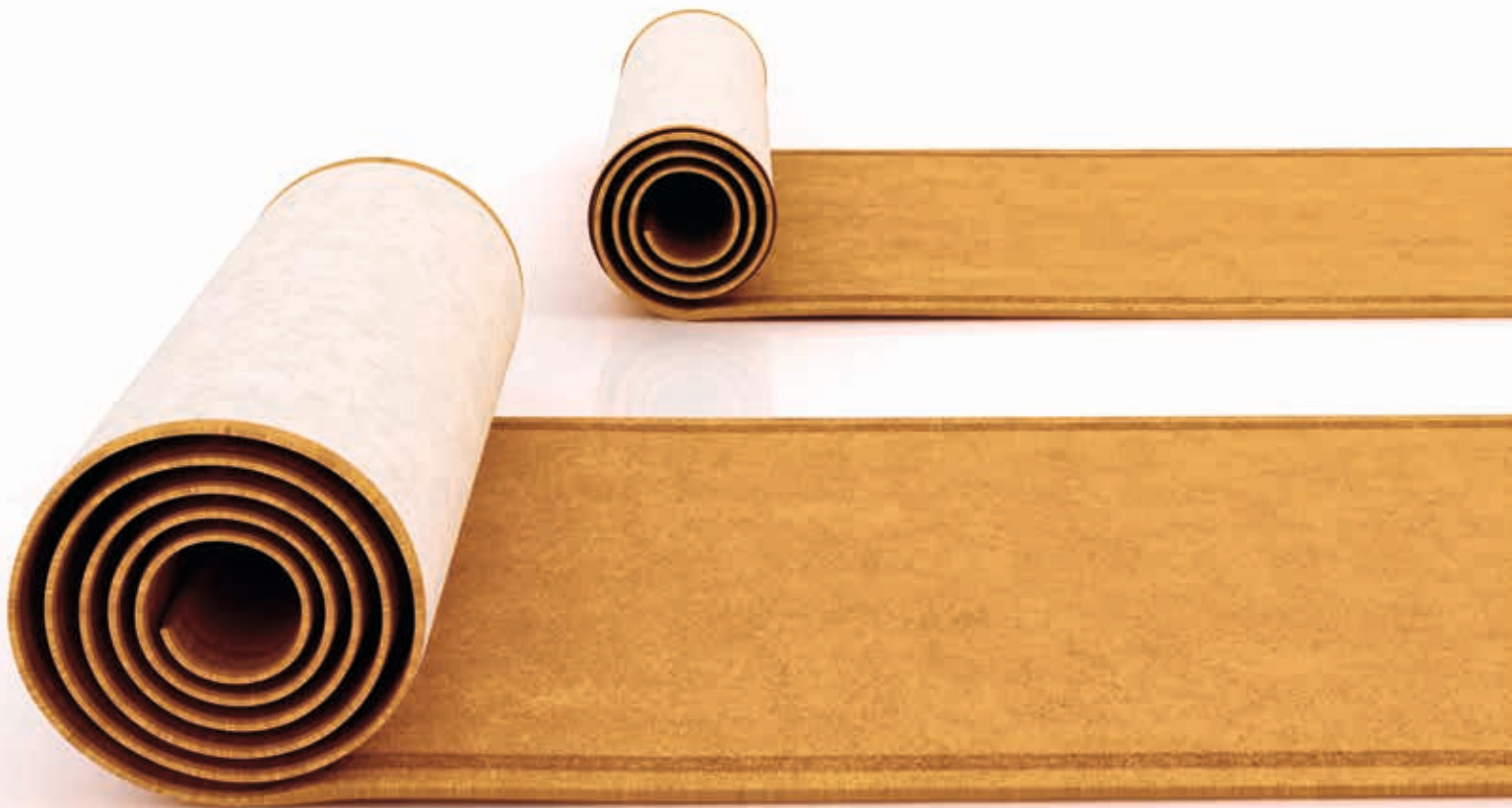
Emission measurements of carpets according to DIN ISO 16000 confirm that GUT (Gemeinschaft umweltfreundlicher Teppichboden e.V.) criteria are easily achievable for carpets with VAE backcoatings. Specifically, no emissions of styrene and 4-PCH (4-phenylcyclohexene) can be detected.

Lower Odor of Carpets with VAE Backcoatings

Traditional fresh carpets have a typical smell coming from 4-PCH (4-phenylcyclohexene) or 4-VCH (4-vinylcyclohexene), which are by-products from SB latex. By using VAE, carpet manufacturers can produce carpets with significantly lower odor, which is an advantage during production as well as in the end product.

Excellent Durability

VAE copolymers are thermal and UV stable. This means that carpet backcoatings formulated with VAE do not get brittle over time. Therefore, no anti-aging additives need to be included in the polymer.



EXCELLENT SERVICE FOR THE CARPET INDUSTRY

A Carpet Lab at Your Service

To support the EMEA (Europe, Middle East and Africa) carpet manufacturers, we have implemented a dedicated state-of-the-art carpet lab in Burghausen, Germany. There, customer specific formulations can be developed and carpet can be coated by foam, full-bath or backcoating (Foulard). Furthermore, the lab can perform in-house testing according to all relevant specifications of the carpet industry including tuft binds, delamination, cut edge stability, Lisson and Vettermann Drum tests.



The Vettermann Drum test mimics the daily stress which a carpet is submitted to. This is especially important for commercial carpet applications.



The Lisson test resembles the strain of shoes on carpet – this way the durability of the carpet can be tested.



The tuft bind test examines how well the precoat adheres the fibers to the primary backing.



The delamination test evaluates the adhesion of the secondary backing to the carpet. This is mainly determined by the secondary coating.



WACKER produces VAE dispersions under the brandname VINNAPAS® at five production sites: in Burghausen and Cologne (Germany), Calvert City (USA), Ulsan (South Korea) and Nanjing (China). We support customers around the globe through 22 technical centers, including a state-of-the-art carpet lab in Burghausen which is dedicated exclusively to our carpet customers. Additionally, the WACKER ACADEMY offers technical training about WACKER's VAE technology.

Reliable tuft lock and delamination properties:
Industry standards for tuft lock and delamination properties can be achieved with formulations based on VINNAPAS® VAE dispersions.

EXPERTISE AND SERVICE NETWORK ON FIVE CONTINENTS



• Sales and production sites, plus 20 technical centers, ensure you a local presence worldwide.

WACKER is one of the world's leading and most research-intensive chemical companies, with total sales of €4.63 billion. Products range from silicones, binders and polymer additives for diverse industrial sectors to bio-engineered pharmaceutical actives and hyperpure silicon for semiconductor and solar applications. As a technology leader focusing on sustainability, WACKER promotes products and ideas that offer a high value-added potential to ensure that current and future generations enjoy a better quality of life based on energy efficiency and protection of the climate and environment. Spanning

the globe with five business divisions, we currently operate 24 production sites worldwide. WACKER is represented by subsidiaries and sales offices in 29 countries in the Americas, Asia, Australia and Europe. With a workforce of 16,300, WACKER sees itself as a reliable innovation partner that develops trailblazing solutions for, and in collaboration with, its customers. WACKER also helps them boost their own success. Our technical centers employ local specialists who assist customers worldwide in the development of products tailored to regional demands, supporting them during every

stage of their complex production processes, if required. WACKER e-solutions are online services provided via our customer portal and as integrated process solutions. Our customers and business partners thus benefit from comprehensive information and reliable service to enable projects and orders to be handled fast, reliably and highly efficiently. Visit us anywhere, anytime around the world at: www.wacker.com

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